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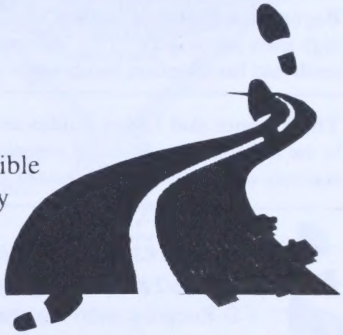
Agriculture
in the
Classroom

The Agriculture Newsletter for Teachers

FALL EDITION 1997

Resources are Like Highways, They Provide Pathways to Understanding!

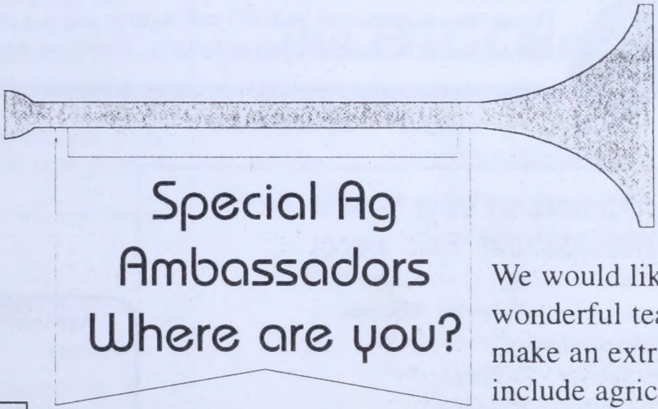


Here at AITC we have an excellent selection of curriculum compatible resources for all grades and a variety of teaching styles. We hope you enjoy using the enclosed listing. As usual there are many new listings to try plus some of the old favorites.

-- see page 2 --

Big Winners at Last Year's Ag Ambassador Fair

-- see page 2 --



Special Ag Ambassadors Where are you?

We would like to honor the wonderful teachers who make an extra effort to include agriculture themes in their programs and those who help their colleagues do it too! If you have done some special things with your class, please let us know or..... if you know of a shy person that is especially deserving tell us. We will tell your stories in the news letter and present selected educators with a coveted Super Ag Ambassador Award. Step right up and share your imaginative ideas with everyone.

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NEW -- Fax (403) 422-7755

Alberta
AGRICULTURE, FOOD AND
RURAL DEVELOPMENT
Agricultural Education and
Community Services

2nd Floor, 7000 - 113 Street
Edmonton, Alberta T6H 5T6
FAX (403) 438-3362   Phone (403) 427-2171

Resources are Like Highways [from page 1]

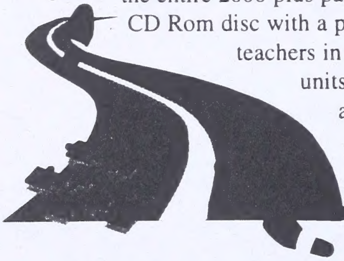
Freeways: Our resources are FREE and here are some of the highlights for this fall.

Quick Dip in the Gene Pool - multi media resource for high schools. There are still some high schools that have not ordered this excellent resource on biotechnology. As of this year we will send second copies to schools on request. Order yours early (A $300.00 value - free to Alberta Educators).

Beyond the Fields of Yellow is brand new. For junior high math and science. This features samples of canola seeds and has excellent independent study application.

The Themes and Issues guides are a great compliment to the full collection of AITC resources especially for teachers who want to group lessons into units of study.

New Routes to the Future: AITC is putting the entire 2000 plus pages of resources on one CD Rom disc with a powerful search engine for teachers in the four western provinces! This will enable teachers to mix and match activities, create units of study and cruise for ideas. The kit will include a complete curriculum fit for Alberta and some curriculum connections for Saskatchewan, Manitoba and British Columbia. This project is sponsored by UGG and Agrium and is a project of the Western Council. The CDs will be ready for you in January. Order any time.



Under Construction: We have been busy writing, editing and researching this summer and will share the resulting resources with you over this next year. Look for these "all new" resources.

Blowing in the Wind - the application of wind power in agriculture. This resource features hands on activities and is a great compliment to environmental and science studies for elementary/junior high. It will be ready in November. Order any time. We will ship it to you as soon as it's ready.

Soil Resource Kit Pilot for Grades 5 and 8 will be ready for testing in February. If you want to be on our list to receive this excellent kit please contact AITC. This is sponsored by the Fertilizer Institute of Canada and will be shared with other provinces in the Fall of 98.

1990, 1993,'4,'5 Institute Lesson Collection will be ready for distribution in the new year. Check out these great ideas for all grades.

Big Winners at Last Year's Ag Ambassador Fair were:

Athabasca Colony School - Athabasca
Dapp School - Dapp
Duchess School - Duchess
Home Schooling - Calgary
New Myrnam School - Myrnam
Rimbey Jr/Sr High School - Rimbey
Spirit River Elementary School - Spirit River
St. Patricks School - Taber
St. Thomas Aquinas School - Medicine Hat
Stettler Elementary School - Stettler
Sunniebend Colony School - Westlock
Waverly School - Stettler

Those of us who participate in the organization and judging of this event truly appreciate the efforts of the contributors and their teachers. Some of the ideas are amazing! I wonder what will arrive in April next year?

Agriculture In The Classroom Newsletter

PURPOSE: To provide Alberta educators with a networking tool containing current information on the agriculture industry and related resources that are available for classroom use.

EDITOR: Betty Gabert

CONTRIBUTORS: Betty Gabert
AgBiotech Bulletin

PRODUCTION: June Blanchette

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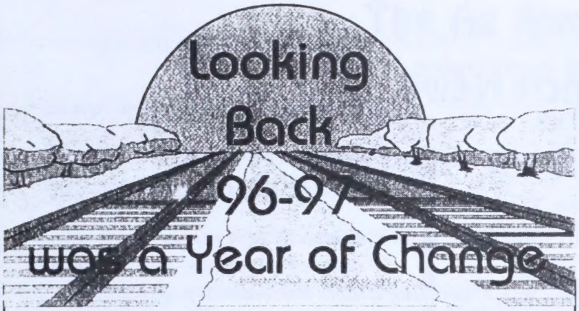
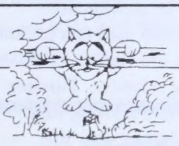


Looking Back 96-97 was a Year of Change

It is a time now to thank our program partners for making the adjustments to the AITC program incredibly positive experiences. UFA Co-op stood solidly behind our new **FREE and EASY** professional development program. On March 13, 1997 80 teachers were treated to a day of trade show, drop-in sessions, laboratory activities, food and entertainment at the U of A. Some of the teachers went on to enjoy an Agriculture Tour and Farm Stay in May. More than 20 have chosen to take the credit option and have been working over the summer with cooperating instructors from the University. Our next news letter will highlight some of their ideas.

The Agriculture Ambassador Fair became a traveling road show visiting 4 rural fairs with some of the most innovative entries. It was great to be able to share these projects with several communities around Alberta. Cindy took the Ag. Ambassador message to: Vegreville, Olds, Pincher Creek and Wanham. Alberta Pool has endorsed the Ambassador program involvement with the new City Slicker Event scheduled for September 25th.

We want to thank all of our program partners for joining us in making last year one of the best yet! Whether you represent industry or are an educator, if you have been thinking about getting involved in the program, this year will offer plenty of choices.



HANGIN' IN

A Problem well stated is a problem half solved.
- Charles F Ketterring

Water, taken in moderation, cannot hurt anybody.
- Mark Twain

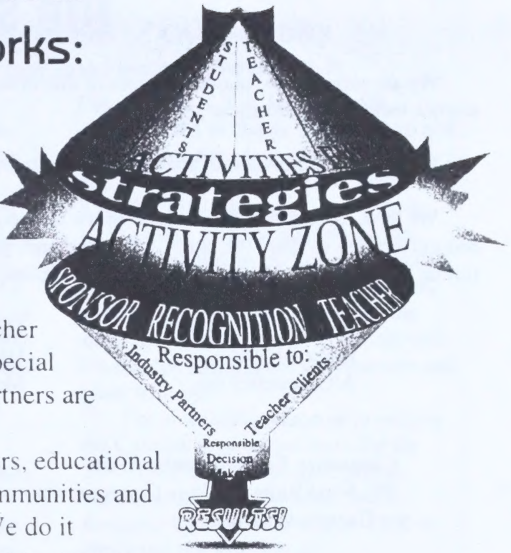
Everyone lives by selling something.
- Robert Louis Stevenson

Sometimes I get the feeling that the whole world is against me- but deep down I know that"s not true. Some of the smaller countries are neutral.
- Robert Orben

The best time to start thinking about your retirement is before the boss does. *- Anonymous*

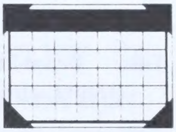
When you're dying of thirst, it's too late to think about digging a well. *- Anonymous*

Here's how AITC works:



We are in the business of resource development and the design and coordination of student and teacher activities and special events. Our partners are the agriculture industry, teachers, educational institutions, communities and government. We do it because we want to ensure a sustainable, global food supply for the future. Alberta will be an essential contributor to this goal.

The AITC Calendar:



September 25 - **Airdrie**
City Slickers Harvest

October 18 - **Jasper Park Lodge**
AITC workshops at the ATA Science Council

Best wishes for a successful conference from:
Alta Genetics
Alberta Agriculture Research Institute
Agriculture in the Classroom Program
More on the council on page 4

January - CD ROM Resource Collection ready for Distribution

February - Soil Kit Pilot in Edmonton, Calgary, Red Deer, Lethbridge, Medicine Hat, Grande Prairie

March 11 - University of Alberta - Free & Easy Educational Extravaganza

April 6, 7, 8 - National Agriculture in the Classroom Conference, Edmonton

April 10 - Agriculture Ambassador School Fair Entries Deadline

ATA Science Council News

We are proud to be major sponsors of this event and are eager to help Alberta Science Educators make the connections between science technology and society.

Participants are invited to attend the interactive workshop coordinated by Agriculture in the Classroom

We have assembled presenters from the Canadian research and technology sector including leaders from industry, government and universities to share the latest in new research and address the challenges of bringing high tech products to consumers. The format will be informal. Join us. Presenters include:

Brian F. Shea Ph.D.
Embryologist
Alta Genetics Inc.

Gil Schultz Ph.D.
Department Head
Medical Biochemistry
University of Calgary

Ralph Christian (Dr.) D.V.M.
Executive Director
Research Division /
Alberta Agriculture Research Institute

Consumer Representative from
The Food Biotechnology Communications Network
Guelph, Ontario

Dr. Leanne Murphy
National Food Committee of the Consumers
Association of Canada

ATA Science Council
Agriculture in the Classroom coordinated Workshops

-- Workshop 1 --

Title: **Beyond the Scientific Process** - STS strategy for creative science educators

Audience: Division 2-3-4 teachers

Workshop Summary: Participants will experience a hands-on simulation of scientific Peer Review (evaluation), a strategy that is the logical companion to all scientific process education. This session will involve participants in science activities that demonstrate how science impacts our daily lives. Plus, experience one of the most effective regulators in the fields of pure and applied science.

The session will have a laboratory format. Bread products will be used in a variety of processes. This strategy can be modified to fit a variety of science education activities from science fair projects, student laboratory experiments to determining risks and benefits of science and technology. Participants will receive extensive free resources for their classrooms.

Participation limit: 40 **Facilitator:** Betty Gabert

-- Workshop 2 --

Title: **Hello Dolly** - an interactive session with practicing Canadian Scientists - follow-up to Ian Wilmut

Audience: All Divisions with a special emphasis for secondary classroom application

Workshop Summary: Find out what's happening in our back yard! Leaders from the agri-food science community (Government, industry and university) will lead this session. Topics will include: Handling issues in the classroom setting. Bio tech and the consumer. Regulating science. Funding scientific research. Intellectual property. Cutting edge science and a future trends that could change your life. Relieving global hunger.

Session leaders will give short presentations then host discussion groups and respond to general questions.

Participation limit: 50 **Facilitator:** Betty Gabert

National AITC Conference in Alberta next Year ?

Alberta AITC recently submitted a proposal to the federal government for assistance to host a National AITC Conference in 1998. **And, we were successful!** The National AITC Conference will be held in Edmonton April 6 & 7, 1998 and the regional meeting on April 8, 1998. Stay tuned for new developments.

The Ag Awareness Clipboard

- A collection of articles and announcements

First Annual Agriculture Theme Park a Success in Rocky Mountain House

Even local people directly involved in agriculture are surprised when they discover the extent to which activities in our community revolve around this primary industry. With that in mind, a team of interested individuals has combined their energy to enhance agricultural awareness in the Rocky area - the result...an Agricultural Theme Park.

Local volunteers have opted for a modest beginning. We've designed this year's pilot project as an activity for grades 4, 5, and 6 children in Rocky Mountain House. Four sub-themes have been selected:

Animals in Agriculture
Preparing the Product
Living with the Environment
Specialized Agricultural Services

Ten stations have been developed to encourage students to explore agriculture though hands-on learning. Some of these activities include a soils lab from U of A, a microbe display from the Lacombe Research Statio, Alberta Cattle Commission By-products display, traditional and exotic farm animals and a working stock dog, to name just a few. For more information contact: Jane Brown at (403) 845-8240 in Rocky Mountain House.

Aware

Accent on Wellness in Agricultural and Rural Environments

An exciting 200 page educational resource for children from ages 4 through 12, addressing agricultural issues that impact on rural health and the environment.

The cost of the resource is $43.99 per copy. Make cheque payable to:

AWARE
Box 1082
Wilkie SK S0K 4W0

For further information about AWARE, contact the program developers by facsimile at (306) 843-2111.

Canolab Announcement of Opportunity

for elementary and junior high school teachers (Grades 4 to 8)

On June 20, 1996, one hundred thousand Canadian canola seeds began an 11 million kilometer voyage through space on route to elementary school classrooms across Canada. This incredible journey is part of the Canolab Project, the Canadian Space Agency's (C.S.A.) and Agriculture and Agri-Food Canada's latest learning adventure aimed at inspiring young Canadians to explore the wonders of nature - both in space and here on Earth - and pursue studies in science and technology.

In 1996 - 97, under the Canolab program, the C.S.A. offered these space-traveled seeds, along with an equal number of ground-based seeds, to more than 2,000 budding Canadian scientists across the country. Due to the success of Canolab, the C.S.A. is once again offering, free of charge, space-flown and ground-based seeds to elementary and junior high school teachers of grade 4 to 8 for the 1997-98 school year. These seeds, along with the accompanying educational and instructional materials, can be used by teachers as a classroom tool to introduce to their students the scientific method as well as impact basic knowledge about space environment and plant biology.

For more information or to receive the Canolab registration form for the 1997-1998 Canolab project, please contact your local Canadian Space Resource Centre at 1-800-511-3500 or check out our web site at:

http://montrealmedia.qc.ca/canolab

Pioneer Hi-Bred Adopts Resistance Management Program

Pioneer Hi-Bred is requiring growers of its Bt corn seed to sign an agreement to plant a block of non-Bt corn near the Bt field as a refuge for European corn borer. The refugee is a key component of a pest resistance management program

- Editor's Note: This is a good example of integrated management where hi tech is combined with low tech to maximize effectiveness.

- The AgBiotech Bulletin Volume 5, Issue 8 August 1997

Interact with Biotech
European Bio-Industries Develop Ethical Guidelines

EuropaBio, the industry association representing some 600 companies actively engaged in biotechnology in Europe, is inviting public comment on a draft statement of its members' "core ethical values". The list of general principles and those related to agriculture are included below:

General principles:

- We are committed to realizing the potential of biotechnology for the benefit of humankind.
- We use biotechnology with full respect for the rights of individuals.
- We will communicate and share information about biotechnology and its derived products, their benefits, and their potential risks in an open fashion.
- We will engage in a dialogue with those who may be concerned about ethical and societal implications of biotechnology.
- We place priority on health, safety, and environmental protection in the manufacture and use of all our products and services.
- We oppose the use of cloning to reproduce human beings and will not undertake it.
- We respect animal welfare by working to reduce their use in research & any disproportionate suffering to them.
- We oppose the use of biotechnology to make any weapons and will not develop products for that purpose.

Agriculture, Food and environment:

- We support transparent product information to promote informed consumer choice.
- We promote efficient and sustainable agriculture.
- We develop improved agricultural products which enhance the world's food supply.
- We support the conservation of genetic and biological diversity.
- We support the transfer of technology between developing countries respecting their cultural heritage.

Contact: Andrew Dickson, Secretary General EuropaBio.
Phone 32 2 735 0313 or
fax 32 2 735 4960

- The AgBiotech Bulletin Volume 5, Issue 8 August 1997

Outdoor & Environmental Programs

For Alberta Schools

Battle Lake Centre —
143 Acre Classroom

- inter-active display centre specifically planned and developed for school groups
- canoeing, archery, hiking trails, waterfront
- overnight camping area accessible by hiking or canoe
- areas developed for wheelchair accessibility
- fireplace, wood burning stove, open campfire areas
- natural fern glade forest, hiking trails along 1/2 mile of shoreline, spruce & poplar forests
- adjacent bird sanctuary

Programs Provide Hands-On Experience and Education:

- fully developed 1 to 4 day program
- customized programs using your choice of modules from 6 themes
- overnight outdoor camping experience
- compliments the Alberta Education curriculum
- active days foster tired campers at night
- promotes learning

Instruction and Staff:

- qualified and experienced with appropriate certification
- combined, more than 50 years of related experience
- structured but flexible
- responsive to suggestions of supervising teachers

1995 FINALIST - EDUCATION CATEGORY:
ALBERTA EMERALD AWARD
for information: **4-H CENTRE - BATTLE LAKE**
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Facilities and Equipment

- indoor meeting and recreation facilities for 150
- dormitory accommodations for 108
- homestyle meals with youth preferences in mind
- indoor & outdoor recreation equipment and facilities
- 1500 sq ft "Bigtop" tent
- firepits, ball diamonds, volleyball courts

THE AGBIOTECH
INFOSOURCE
Issue 29 June, 1997
Published by AG-WEST BIOTECH INC.

Biotechnology in Cyberspace:

Your Guide to Biotech Resources on the Internet

Biotechnology —the leading edge science that is revolutionizing agriculture — is developing at an amazing pace. Traditional educational resources may have difficulty keeping up with biotech research breakthroughs and technical achievements.

Not to worry. The Internet offers a better way to access the most up-to-date information available every day. Dozens of sites on the World Wide Web offer students and teachers opportunities to learn the latest on biotechnology. From technical, how-to information to debates about the morality of genetic engineering, it's all out there in cyberspace waiting to be explored. We've prepared a list of sites which offer good material for students.

Educational Sites

Biotech Educational Resources (Indiana University)

http://biotech.chem.indiana.edu/pages/education.html

This may be the top web site for students interested in biotechnology, not because of the information it contains, but because of the dozens of active links it offers to other educational sites. (The site is also of interest to students in other branches of science, especially chemistry.) Links are provided to sites offering graphic-rich guidebooks, bioscience video and on-line biotech courses.

Several links offer actual courses with a/v supports that can be used as a supplement to classroom materials. (You'll need video plug-ins to take full advantage of these sites.) Examples include:

- ***Cells Alive!*** http://www.cellsalive.com

A very lively site about bacteriology and cell biology intended for beginning biology students. Lots of animations and images.

- ***HHMI Virtual Lab*** http://www.telefusion.com/lectures/hiband/neat/index.html

An interactive site which gives access to a "virtual lab" as well as to lectures and exhibitions.

- ***UCI Life Science Education Guide*** http://www-sci.lib.uci.edu/SEP/life.html

A comprehensive, annotated list of life-science-related instructional Webresources. The entries are broken down by category and then by estimated grade level ranging from kindergarten to university graduates.

Access Excellence

http://www.gene.com:80/ae/

Called "A Place in Cyberspace for Biology Learning and Teaching", this is another excellent educational site for biotech and other biosciences. Interest areas include:

- Bioethics in the Classroom;
- Weekly science reports, interviews with news-making scientists and funfactoids;
- Online seminars, projects, and discussions hosted by scientists and teachers; and
- Activities Exchange - Biology-related activities and classroom projects developed by teachers.

Ag-Biotech Industry Sites

Ag-West Biotech

http://www.lights.com/agwest/

Ag-West Biotech Inc. is a non-profit company located at Innovation Place, north of the University of Saskatchewan in Saskatoon, Saskatchewan. It promotes Saskatchewan's involvement in ag-biotech. Among other resources, the site contains all issues of *Ag-Biotech Infosource* and the monthly *Ag-Biotech Bulletin*. It also provides links to many of the biotech organizations in Saskatchewan.

Global Agricultural Biotechnology Association (GABA)

http://www.lights.com/gaba/tech/index.html

This page is intended as a clearing house of news, information and opportunities. Though only GABA members have full access, students are welcome to browse the collection of Current News and Opportunities Articles. Articles on the development of health, environmental and safety regulations are also available.

National Research Council / Plant Biotechnology Institute

http://www.pbi.nrc.ca/pbiintro.html

Located in Saskatoon, the Plant Biotechnology Institute (PBI) is one of five NRC institutes involved in biotechnology. PBI is primarily focused on the improvement of Canadian crops, specifically canola, cereals and grain legumes. All issues of the PBI Bulletin are archived.

InfoAgbiotech

http://aceis.agr.ca/fpi/agbiotec/english.html

Maintained by The Biotechnology Strategies and Coordination Office of Agriculture Canada, this site includes detailed information on:

- Regulating products of biotechnology;
- Information Bulletins on a dozen key biotech topics; and
- Information on commodity areas such as Microbial FertilizerSupplements; Novel Feeds; Plants with Novel Traits; and Veterinary Biologics.

Food Biotechnology Centre

http://www.biotech.ca/fbc/

This site contains copies of the Centre's bulletin, and an interesting chronological history of food biotechnology.

Food and Agriculture Organization of the United Nations

http://www.fao.org/

Called the World Agricultural Information Centre, this site is not restricted to biotech themes, but provides an interesting and accessible source for general information on the world food and agricultural situation. The site also includes FAO's digital photo archive; FactFile; and a site search engine.

General Biotech Sites

InfoBiotech Canada

http://www.ibc.nrc.ca/ibc/

InfoBiotech Canada (IBC) is a partnership of government, private and academic sectors with the goal of providing enhanced access to information on Biotechnology in Canada and worldwide. Access areas include: Canadian, global, organizational and corporate sites; biotechnology events; research activity and others.

Biotechnology Industry Organization Library

http://www.bio.org/bio/library.html

This site includes dozens of electronic publications on topics ranging from *Agricultural Biotechnology: the Future of the World's Food Supply* to *Bioremediation, a Natural Answer to Environmental Reclamation.* Other topics of interest include resources such as *Real Life Problems: Biotech Answers, 1996 High School Essay Contest Winners* and *Tools for Teaching Biotechnology: A Bibliography of Resources.*

Strategis

http://strategis.ic.gc.ca

Strategis makes the information resources of Industry Canada, the federal government's economic department, available to the public. Information on consumer and business developments in Canada and world-wide are featured. Use the site's search tool to find sites and documents related to biotechnology.

Other Science News Sites

Newswire

http://www.ari.net/newswire/nwhome.htm

Newswire maintains a comprehensive database of news releases from top institutions engaged in scientific, medical and business research. The friendly interface allows you to flexibly search, browse or download any article or abstract. Many articles are biotech-related.

New Scientist Planet Science

http://www.newscientist.com/

This colourful site is chock-full of frequently updated science news. The on-line version of the leading popular scientific journal in Europe, "Planet Science" includes such features as answers to seemingly wacky scientific questions, ideas for experiments, interviews and news tidbits. Although the award winning site covers all kinds of science stories, some of the best coverage is of biotechnology.

If you would like to receive future issues of this agbiotechnology information publication for schools, please contact:

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Web: http://www.lights.com/agwest

Published by
Westcross House Publications, 608 Duchess Street
Saskatoon, Sask., S7K 0R1 Canada
(306) 934-1772 Fax: (306) 664-6615
E-mail: signatur@eagle.wbm.ca

Funding assistance provided by
Saskatchewan Agriculture and Food

THE AGBIOTECH INFOSOURCE

Issue 28 May, 1997

Published by AG-WEST BIOTECH INC.

Cloning Mammals: New Opportunities For Agriculture

Hello Dolly!

Last February, a sheep named Dolly — a clone produced by a team of scientists at the Roslin Institute in Scotland — became an international sensation. Why all the fuss? After all, *cloning* (making an exact copy of another Living organism) occurs in nature all the time and has been undertaken before in the laboratory.

People found Dolly extraordinary because she is the first clone of a *mature mammal*. Previously, scientists thought that cloning an adult mammal was impossible, or would at least require decades of additional research. With the unexpected cloning of Dolly, it appeared that the fantasies of science fiction writers had suddenly taken an uncomfortable step toward reality. The cloning of a mammal naturally leads to troubling questions about the possibility of cloning human beings. Could this technology be used, for example, by a dictator — a Hitler — to clone himself?

Dolly, the lamb pictured above, is the first-ever clone of an adult mammal.

Clearly, cloning is a remarkable new technology and like all technologies it presents exciting opportunities, as well as ethical questions that are difficult to answer.

How Does Cloning Work?

Dolly was not produced in the normal way — the mating of a ewe and a ram. Instead, she was cloned from a single cell taken from the *non-reproductive* tissue of a six-year-old ewe.

Similar technology has been used before to clone identical lambs and other animals from different cells of the same *reproductive* tissue or embryo. The Alberta-based company Alta Genetics, for example, has previously used the technology to clone calves.

Dolly is unique, however, in that all her *nuclear DNA* — the substance inside the nucleus of an organism's cells that contains a "blueprint" for its inherited characteristics — originated in a cell taken from the udder tissue of an adult sheep. The technology shows that "mature" cells that have already developed to a point where they fulfill a specialized role — such as a mammary or other tissue cell — could be returned to a primitive state from which they could grow into an entire organism.

To produce a clone, the Roslin researchers combine material from two sources. One is egg cells called *oocytes* from the sheep's ovaries. They then remove the original *chromosomes* (structures of DNA) from the nucleus of these oocytes to leave DNA-free cell nuclei.

The other source is cells containing donor nuclear DNA material, in this case a cell from the donor's udder. The researchers then joined the nucleus-free oocyte with the donor cell by putting them together and subjecting them to an electric current. The two cells then fuse as one cell, and after growing and dividing for a week or so in the laboratory in a culture, the fused cell forms an early embryo which is then implanted into a surrogate mother.

The cloning technology is far from perfected: Dolly was the only lamb born from 277 fusions of oocytes with udder cells. It is important to note that for cloning to have any practical use, the technology will have to be shown to be repeatable and significantly improved to make it more economic.

Is cloning "unnatural"?

Actually, many simple organisms in nature, such as bacteria and yeasts, use cell division (which is similar to cloning) to reproduce. Some larger organisms like certain snails and shrimp also reproduce through cloning. Even in higher species, including human beings, a process with parallels to cloning sometimes results in genetically identical twins.

However, as sexual reproduction is the only way in nature to change and improve the genetic stock of a species, most asexual species tend to die off over time. That is why many species that reproduce by cloning most of the time also reproduce sexually every few generations.

What Are the Potential Benefits of Cloning?

If cloning can be repeated, two new opportunities could eventually become available. First, it will become possible to produce a number of genetically identical offspring from cells taken from an individual animal that has already proven itself superior. This would enable a producer to have a group of identical animals with the same high level of performance. Cloned animals would also be useful in scientific research. For example, research on cloned animals would remove the factor of genetic variation when looking for the cause of disease.

Second, while the donor cells are in culture, it may be possible to introduce desirable genetic changes — such as disease resistance — before the cells are used to produce clones. With cloning technology, when a clone is perfected, it could then be reproduced in large numbers quickly and cheaply with the assurance of consistent quality. Cloning would probably only be used in the early stages of herd development to create "founder flocks" which would then be allowed to breed naturally.

And whether cloning is ever widely used by livestock producers, the technologies involved have tremendous implications for biological research in general.

Are There Dangers Involved?

One danger that could be involved if cloning technology is developed and adopted on a large scale is the risk that the group of clones might all prove susceptible to the same infection or other health problem. Diversity is a desirable element in nature, therefore cloning would likely only be used to a limited extent and at certain stages in the breeding of improved animals.

National Library of Canada
Bibliothèque nationale du Canada
3 3286 51377 3867

The problem of uniformity has lead one pioneer in animal biotechnology to argue that cloning will never become widespread in agriculture. He points out that animal breeding makes progress precisely because of genetic variation, while cl ir present state.

Can Humans Be Cloned?

Could cloning be used to create copies of people? Probably. However, the development of human cloning is unlikely to be pursued for ethical reasons. In fact, many nations have already banned human cloning. With the successful cloning of Dolly, other nations are likely to follow suit.

Even if human cloning were used illegally by a "mad scientist" or an unscrupulous dictator, it is highly unlikely that cloned people would be identical to the original, as individuals are the result of a variety of influences besides genetics.

Genetic technologies are, however, used in human medical research in the attempt to find genetic causes of human diseases.

Learning More About Cloning

If you are interested in learning more about the complex scientific and ethical issues related to cloning, a couple of outstanding Internet sites may be of interest:

- The Roslin Institute is the research centre where Dolly was produced. Its web site provides full information on the cloning process. The site is at http://www.ri.bbsrc.ac.uk
- The New Scientist web site provides detailed descriptions and high quality diagrams of the cloning process, and plenty of links to other related web sites. Find it at http://www.newscientist.com/clone/

Special thanks to Dr. Reuben Mapletoft of the Western College of Veterinary Medicine at the University of Saskatchewan for his assistance in reviewing this material prior to publication.

If you would like to receive future issues of this agbiotechnology information publication for schools, please contact:

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Published by
Westcross House Publications, 608 Duchess Street
Saskatoon, Sask., S7K 0R1 Canada
(306) 934-1772 Fax: (306) 664-6615
E-mail: signatur@eagle.wbm.ca

Funding assistance provided by
Saskatchewan Agriculture and Food